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### New Knowledge The Mechanisms of the Cytoplasm

This continuous body of knowledge, which should be properly named cellular and molecular biology, could be compared to a bridge which, like its equivalents in civil engineering, has two bridgeheads: one in traditional anatomical-morphological sciences and the other in equally traditional biochemistry. The cautious and careful have stayed close to the bridgeheads because the area around them had been consolidated over centuries by the work of their predecessors. The bold and venture-some have ventured on the bridge itself from both directions, because they believed that there was where the action was going to be. . . . As in the old Latin proverb, fortune favored the bold: the bridge proved to be strong enough to support the intense occasionally frantic activity of whole armies of explorers.

(Palade, 1987, pp. 112–13)

In the 1950s and 1960s the initial ventures into the terra incognita between classical cytology and biochemistry developed into the robust bridge Palade identified in the above quotation.<sup>1</sup> In large part this involved building on the localization of cellular energetics in the mitochondria, and of protein synthesis in the microsomes, that had been established in the 1940s by decomposing these organelles and figuring out the operations associated with their parts. I will focus principally on these developments, but in the 1950s investigators identified the function of two other organelles – the Golgi apparatus and

<sup>1</sup> For Palade this was not just a perspective adopted in retrospect. Already in 1956 he commented on the integration of morphological and biochemical research: “The ample information obtained in each of these two fields has stimulated research in the other, with the result that a number of cell components have acquired a new biochemical and physiological significance. The concept of functional differentiation among cell organs has been more firmly established, and the previously sharp boundary between cell morphology and cell physiology and biochemistry has, to a large extent, faded away” (Palade, 1956a, pp. 186–7).